Adamawa State University Journal of Scientific Research
Volume 8 Issue 2, 2020; Article no. ADSUJSR 0802006
ISSN: 2705-1900 (Online); ISSN: 2251-0702 (Print)
http://www.adsujsr.com

Application of Data Mining on Agricultural Credit Guarantee Scheme Fund and its impacts on Natural Rubber Production in Nigeria

Yuniyus Dengle Giroh[1] and Nachandiya Nathan[2]
[1]Department of Agricultural Economics and Extension, Modibbo Adama University of Technology PMB 2076, Yola Nigeria
[2]Department of Computer Science, Adamawa State University, Mubi.
Contact: *nachandiya@yahoo.com*

(Received in July 2020; Accepted in September 2020)

Abstract

This study was carried out to examine the impact of Agricultural Credit Guarantee Scheme Fund on Natural Rubber Production in Nigeria using time series data on natural production in Nigeria, number of loans and values of loans guaranteed by Agricultural Credit Guarantee Scheme Fund from 1981 to 2018. Result of Augmented Dickey Fuller indicated that natural rubber output and number of loans applied were stationary at first difference at 5% level of significance while total credit guaranteed became stationary at second differencing which was also significant at 5%. The Johansen co-integration test result also indicated that there was co-integrating relationship between natural rubber production in Nigeria and Agricultural credit guarantee scheme fund over the period under study. The speed of adjustment of the model from short – run to long – run equilibrium using ECM was -0.64855 and revealed that deviation in natural rubber output increase in Nigeria from the long- run equilibrium is corrected by 64.86% in the current period. Amount of credit guaranteed had significant relationship with natural rubber production. It is suggested that the value of credit guaranteed to rubber farmers should be increased so as to enable natural rubber farmers expand their production to enhance foreign exchange earnings in the Agricultural transformation plan of Nigeria.

Keywords: Agricultural credit; Guarantee; Nigeria; Time series Co-integration.

Introduction

Natural Rubber (*Hevea brasiliensis*) was introduced into Nigeria from England around 1895 with over 250,000 hectares of land under natural rubber production in the country (Umar *et al.*, 2017). Natural rubber was ranked as the fourth most valuable agricultural export commodity in Nigeria after cocoa, groundnut and palm kernel, with 92 percent of natural rubber production exported, making rubber essentially a foreign exchange earner for the national economy(Abolagba *et al.*,2010, Umar *et al.*, 2017). The introduction of Structural Adjustment Programme (SAP) in1986 and other programmes resulted to increase in production. The increase in output was not as a result of increase in hectarage cultivated, but it was because farmers returned to the tapping of abandoned plantations because of the high prices of rubber. Thereafter, the trend has been warping and this could be traced to a number of factors such as unstable government policies as well as crash in world prices of rubber which affects producers (Schroth *et al.*, 2004). The increase in natural production of rubber as well as other export crops by farmers in Nigeria has been hindered by several factors notable amongst them is poor accessibility to credit to sustain production let alone expand production to harness the growing export market of major Agricultural commodities. Nigerian agriculture is largely subsistence and accesses to adequate funds have been a major bottleneck. The sector is highly risky as compared to other sectors of the economy making commercial banks feeling reluctant to provide credit for real sector activities, especially agricultural production (Omojimite, 2012). The importance of credit to Agricultural production cannot be overemphasized and in view of this, the Agricultural Credit Guarantee Scheme Fund (ACGSF) was set up with the sole purpose of providing guarantee in respect of loans granted by any bank for agricultural purposes which include small holder and estate development of natural rubber. The Scheme was established by Decree 20 of March, 1977 and as amended on 13th June, 1988 (Nwosu *et al.*, 2010). It provides for a

fund of N100 million subscribed to by the Federal Government (60%) and Central Bank of Nigeria (40%). The fund was enhanced to one billion naira in 1999 and later to four billion naira in 2006 (CBN; 2007, Oyakhilomen *et al.,* 2012). The Scheme provides guarantee cover for loans advanced to the agricultural sector by banks and the cover pledges to pay to the banks 75% of any outstanding default balance by borrowers provided that collateral pledged has been realised and applied to the account. From 1981 to 2018, it is recorded that the scheme guaranteed loans valued at₦31, 273,000,000.00 to natural rubber production with 403 applications. It has become imperative to evaluate the performance of the scheme with respect to natural production. In view of this, the study was designed to assess the impact of the scheme on the production of natural rubber.

Materials and Methods

The Data

The study employed secondary data on natural rubber output in Nigeria, number of loans applied and value of loans guaranteed by Agricultural credit guarantee scheme fund from 1981 to 2018. The data were sourced from central Bank of Nigeria statistical Bulletin and National Bureau of Statistics.

Analytical Techniques

Test for Unit Root

To avoid spurious regression which is a common problem in time series analysis, the data were first subjected to Integration test using the Augmented Dickey – Fuller (ADF) test. Two conditions must be met for variables to be co-integrated. First, the series must have the same order of integration. Second, there must be some linear combination (r) of variables, which must be at most of order one less than the number of individual variables (n), that is r = n-1 (Townsend and Thirtle, 1997). If r = n, then the series are stationary and co-integrated. Engle and Granger (1987) noted that a linear combination of two or more I(1) series may be stationary, or I(0), in which case we say the series are co-integrated. If the null for no co-integration is rejected, the lagged residual from the co-integrating regression are imposed as the error correction term in a vector error correction model.

It is specified as:

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{t-1}^{k} \beta \Delta X_{t-1} 1 + e_t \qquad (1)$$

Test for Co – integration

Johansen's approach was also carried out to determine the number of co- integrating vectors using Johansen test which was based on maximum likelihood estimates of all the co - integrating vectors in a given set of variables and provides the likelihood ratio test for the number of co-integrating vectors. The underlying principle of the Johansen co- integration test is that if the coefficient matrix (n) has reduced rank (r < n), it can be decomposed into a matrix (n x r) of loading coefficients (a) and a matrix (n x r) of co-integrating vectors (P) such that n = aP'. r is the number of co-integration relations (the co- integrating rank). The loading coefficients (a) indicate the co-integration relationships in the individual equations of the system and of the speed of adjustment to disequilibrium and therefore, determines the causality in the system and the direction of causality flows while the co-integrating vectors (P) represent the long run equilibrium relationship. Johansen (1988) opined two likelihood ratio tests, namely the Trace and the Maximum Eigen Value statistic tests, which are used to determine the number of co-integrating equations given by the co-integration rank (r). A co-integration equation is the long-run equation of co-integrated series. The Trace statistic tests the null hypothesis of r co-integrating relations against the alternative of k co-integrating relations, where k is the number of endogenous variables for r = 0, 1,.. , k - 1. The Maximum Eigen Value statistic tests the null hypothesis of r co-integrating vectors against the alternative of r + 1 co-integrating vectors. The optimal lag lengths for the unit root and Johansen's co-integration tests are decided by the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC). The model is given as:

$$X_t = C_t + \lambda 1 X_{t-1} + \ldots + \beta_k X_{t-k-} + e_t \qquad (2)$$

The first difference form is given as:

$$\Delta X_t = C_t + \lambda_{k-1} X_{t-k} + \ldots + \beta_1 X_{t-1+} e_t \qquad (3)$$

Where X_1 is vector of n variables e_t is error term.

Model specification

In order to examine the relationship between Agricultural credit guarantee scheme fund and natural production in Nigeria, the model expressed natural rubber output in Nigeria as a function of lag of the value of loans guaranteed by ACGSF(₦) and the lag of the number of loans guaranteed by ACGSF. It is stated as:

$$Y = \beta 0 + \beta 1 \, X_1 + \beta 2 \, X_2 + \text{ecm}(1) \qquad (4)$$

Where *Y* is output of natural rubber in tonnes; X_1= number of loan applications, X_2 = value of credit (naira) and ecm t_{-1} = regressor to capture short run relationship or dynamics.

Results and Discussion

Test for Unit Root

Augmented Dickey Fuller (ADF) unit root test was employed to examine the presence of stationary in the variables to be used in the study. The result in Table 1 indicated that natural rubber output and number of loans applied were stationary at first difference at 5% level of significance while total credit guaranteed became stationary at second differencing which was also significant at 5%.

For the lag order selection criteria, the reported values for the Lkelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwartz Criterion (SC) and Hannan-Quinn Criterion (HQ) are at one lag which is preferred (*) over other lag structures(Table 2).

Table 1: Result of Unit Root Test

Variable	ADF - Statistics	Critical value	Order of Integration
D(ACGSF)	-8.38	-3.67**	2
D(No of Application)	-7.87	-4.28**	1
D(Rubber Output)	-6.75	-4.24**	1

Source: Data Analysis 2020. *** Indicates significance @ 5% probability level

Table 2: Lag order Selection Test Result

Lag	LL	LR	df	p	FPE	AIC	HQ	SC
0	-454.527				6.4e+09	25.4181	25.4642	25.5501
1	-442.953	23.147*	1	0.000	3.6e+09*	24.8307*	24.8921*	25.0067*
2	-442.936	.03362	1	0.855	3.8e+09	24.8853	24.9621	25.1053

Source: Data Analysis 2020

Test for Co – integration

The results of the Johansen Trace and Maximal Eigen value tests have been reported in Table 3 and Table 4. The test in Table 3 suggests 2 co-integrating vectors at the 0.05 level. From the maximal Eigen value test in Table 4, it is seen that there is no co-integration relationship (r=0) has been rejected since the calculated is 22.37520 which is greater than the critical value at the 5% significance level. The statistic has suggested that there are 2 co-integrating vectors at the 0.05 level. Therefore, two co-integrating relationships exist among the variables in the output of natural rubber. The implication of this result is that Agricultural Credit Guarantee Scheme Fund had significant influence on the output of natural production in Nigeria over the period of 1981 to 2018. The major finding of this study is in agreement with the findings of Efobi and Osabuohien (2011), who found out that there existed a long run relationship between non-oil export and ACGSF on cash crop, food crop, livestock production, other categories of agricultural production and political constraint in a study on assessment of the role of agricultural credit guarantee scheme fund in promoting non-oil export in Nigeria.

Table 3: Unrestricted Co - integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.462880	38.22981	29.79707	0.0042
At most 1*	0.260166	15.85461	15.49471	0.0441
At most 2 *	0.129838	5.006739	3.841466	0.0252

Trace test indicates 3 co-integrating equation(s) at the 0.05 level* denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

Table 4: Unrestricted Co integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.462880	22.37520	21.13162	0.0333
At most 1	0.260166	10.84788	14.26460	0.1620
At most 2 *	0.129838	5.006739	3.841466	0.0252

Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level* denotes rejection of the hypothesis at the 0.05 level**MacKinnon-Haug-Michelis (1999) p-values

Table 5: Estimate of short run error correction model

Variable	Coefficient	Standard error	T statistic
ECM(-1)	-0.64855	0.19485	-3.3285
ECM(-2)	-0.148535	0.19582	-0.75852
NOAPP	4.252.004	2.852.98	1.49037
CREDIT	0.727161	0.190841	3.81029
Constant	8622.934	28012.1	-0.30783
R-squared 0.6711			

Source: Data Analysis 2020

Short – run Error Correction Result

Error correction mechanism was carried out to address deviations in the short–run from the long – run relationship arising from results in Table 3 and Table 4. As a consequence of the difference, the short – run interactions and the adjustments to the long – run equilibrium is necessary for policy implication for natural rubber production in the country. The speed of adjustment of the model from short – run to long – run equilibrium necessitated the error correction term. Table 5 revealed that ECM coefficient of -0.64855and statistically significant at 1% and confirm to economic theory. The significance of the ECM supports co-integration suggesting the existence of long-run steady equilibrium relationship between natural rubber output and other factors in the specified model. The coefficient of -0.64855 revealed that deviation in natural rubber output increase in Nigeria from the long- run equilibrium is corrected by 64.86% in the current period . The coefficient for credit was significant at 5% level and sustained increase in the amount of credit guaranteed would lead to increase in natural rubber output *ceteris paribus*. The R-squared value of 0. 6711showed that the model accounts for 67.11 % of the variations in value of loans guaranteed under the ACGSF.

Conclusion and Policy Implication

Long run relationship existed in natural rubber export for the periods (1981-2018).The coefficient of ECM of -0.64855 revealed that deviation in natural rubber output increase in Nigeria from the long- run equilibrium is corrected by 64.86% in the current period. Reductions in the value of credit would have a corresponding reduction in natural rubber output. There is the need for increase of credit from the scheme to boost natural rubber production as this would help in diversifying the economy.

References

Abolagba, E.O., C.N Onyekwere., B.N. Agbonkpolor and H.Y Umar (2010): Determinants of Agricultural Exports. *Journal of Human Ecology*.29. (3), 181 – 184

Central Bank of Nigeria, (2007). Statistical Bulletin, Vol.18. December, 2007.

Dickey,D.A. and Fuller,W.A.(1979). Testing for Serial Correlation in Least Square Regression. *Econometrica*. 58: 20-35.

Efobi, U. R. and Osabuohe, E.S (2011). Assessment of the Role of Agricultural Credit Guarantee Scheme Fund in Promoting NonOil Export in Nigeria. Paper Accepted for Presentation at the International Conference on 'Economic Development in Africa' by the Centre for the Study of African Economies (CSAE) at Oxford University, United Kingdom, March 19-21, 2011.pp. 1-20.

Engle, R.F. and Granger, C.W.J. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrics.* 55: 251-276.

Johansen, S. (1988): Statistical Analysis of Co-integration Vectors. *Journal of Economics Dynamics and Control*, 12: 231-254.

Nwosu, F. O., Oguoma, N.N.O., Ben-Chendo, N.G. and Henri-Ukoha, A. (2010): The Agricultural Credit Guarantee Scheme: its Roles, Problems and Prospects in Nigeria's quest for Agricultural Development. *Researcher* 2(2): 87-90.

Omojimite, B.O. (2012). Institutions, Macroeconomic Policy and Growth of Agricultural Sector in Nigeria, *Global Journal of Human Social Science*, 12(1): 1-8.

Schroth, G., Moraes, V.H. F and da Mota, M.S.S. (2004): Increasing the profitability of traditional, planted rubber agro forest at the Tapajo's river, Brazilian Amazon. *Journal Agriculture, Ecosystems and Environment.*102: 319 –339.

Townsend, R and Thirtle, C. (1997): Dynamic Acreage Response: an Error Correction Model for Maize and Tobacco in Zimbabwe. In R. Rose, C. Tanner and M.A. Belamy, (eds), Issues in Agricultural Competitiveness, markets and policies. International Association of Agricultural Economics (IAAE) Occasional Papers: No. 7, pp. 192-200.

Umar, H. Y, Okore, N.E, Toryila, M., Asemota, B. and Okore, I.K (2017): Evaluation of the Impact of Climatic Factors on Latex Yield of *Hevea Brasiliensis International Journal of Research Studies in Agricultural Sciences 3(5): 28-33* *http://dx.doi.org/10.20431/2454-6224.0305004*

Umar, H. Y., D. Y. Giroh, N. B. Agbonkpolor, and C. S. Mesike. (2011): An overview of world natural rubber production and consumption: An implication for economic empowerment and poverty alleviation in Nigeria. *Journal of Human Ecology* 33:53–59.